CLAIMS

We claim:

1   1.   A method in a network access device comprising:

2   without proxying, analyzing each of a stream of packets traversing a single

3   connection through the network access device from an external host to a

4   protected host;

5   forwarding each allowed packet of the stream of packets as long as the connection is

6   active; and

7   if one of the stream of packets is determined to be disallowed by said analyzing, then

8   discarding the disallowed packet and terminating the connection, causing the

9   protected host to discard those packets received on the terminated connection.

1   2.   The method of claim 1 wherein analyzing each of the stream of packets comprises

2   inspecting a header of each of the stream of packets against a packet filter.

1   3.   The method of claim 1 wherein analyzing each of the stream of packets comprises

2   inspecting a payload of each of the stream of packets for disallowed content.

1   4.   The method of claim 3 wherein inspecting the payload of each of the stream of

2   packets comprises copying the payload, analyzing the payload, and discarding the

3   corresponding packet if the payload is threatening.

1   5.   The method of claim 1 further comprising:

2   copying a payload from each of a plurality of packets that comprise a file, the stream

3   of packets including the plurality of packets;

4   forwarding all but the last of the plurality of packets to the protected host;

5   reassembling the plurality of packets into the file;

6   analyzing the file;

7   if the file is a threatening file then discarding the last packet and terminating the

8   connection; and

9   if the file is non-threatening, then forwarding the last packet.

1   6.   A computer implemented method comprising:

2   copying a packet payload of each of a plurality of packets received on a single

3   connection between an external host and a protected host that carries a stream

4   of packets the stream of packets including the plurality of packets;

5   forwarding all but the last of the plurality of packets to the protected host;

6   reassembling the copied packet payloads into a file;

7   analyzing the file to determine if the file is allowed or disallowed;

8   if the file is allowed, then forwarding the last packet to the protected host; and

9   if the file is determined to be disallowed, then dropping the last packet and

10   terminating the connection.

1   7.   The computer implemented method of claim 6 wherein the analyzing the file

2   comprises performing anti-virus analysis on the file.

1   8.   The computer implemented method of claim 6 further comprising:

2   analyzing a header of each of the stream of packets; and

3   if one of the stream of packets is determined to be disallowed, then discarding the

4   disallowed packet and terminating the connection.

1   9.   The computer implemented method of claim 8 wherein analyzing the header

2   comprises inspecting addresses indicated in the header against a packet filter.

1   10.   The computer implemented method of claim 6 further comprising:

2   individually analyzing each of the copied packet payloads; and

3 if one of the copied packet payloads is determined to be threatening, then discarding

4 the corresponding packet and terminating the connection.

1 11. The computer implemented method of claim 10 wherein analyzing each of the copied

2 packet payloads comprises inspecting each copied packet payload against a list of disallowed

3 content and determining if each copied packet payload includes threatening script.

1 12. The computer implemented method of claim 6 further comprising maintaining the

2 connection while analyzing the file.

1 13. The computer implemented method of claim 12 wherein maintaining the connection

2 comprises:

3 decapsulating the last packet's payload;

4 fragmenting the last packet's payload into subparts;

5 encapsulating each subpart; and

6 forwarding each subpart until analysis is complete.

1 14. The computer implemented method of claim 12 wherein maintaining the connection

2 comprises:

3 copying each of the plurality of packets but the last packet before forwarding each of

4 the plurality of packets; and

5 holding the last packet and repeatedly forwarding the last copied packet.

1 15. The computer implemented method of claim 12 wherein maintaining the connection

2 comprises increasing transmission latency of each acknowledgement transmitted from the

3 protected host to the external host until the analysis is complete.

1   16.   The computer implemented method of claim 6 wherein forwarding each of the

2   plurality of packets comprises transmitting a message indicating that each of the of the

3   plurality of packets is allowed.

1   17.   A computer implemented method comprising:

2   supporting a connection from an external host to a protected host;

3   analyzing a header of each packet received over the connection from the external

4   host;

5   terminating the connection if a first packet received over the connection is determined

6   to be disallowed and discarding the first packet;

7   if the connection is not terminated, copying the first packet's payload;

8   analyzing the first packet's payload;

9   terminating the connection if said first packet's payload is determined to be

10   disallowed and discarding the first packet;

11   if the connection has not been terminated and if said first packet's payload is not a last

12   block of a file, then forwarding said first packet to the protected host;

13   if said first packet's payload is the last block of a file, then reassembling the first

14   packet's payload with a set of one or more previously copied packet payloads

15   into the file;

16   analyzing the file to determine if the file is allowed or disallowed;

17   if the file is disallowed then dropping the first packet and terminating the connection;

18   and

19   if the file is allowed then forwarding the first packet.

1   18.   The computer implemented method of claim 17 further comprising maintaining the

2   connection while analyzing the file.

1   19.   The computer implemented method of claim 18 wherein maintaining the connection

2   comprises:

3   decapsulating the last packet's payload;

4   fragmenting the last packet's payload into subparts;

5   encapsulating each subpart; and

6   forwarding each subpart until analysis is complete.

1   20.   The computer implemented method of claim 18 wherein maintaining the connection

2   comprises:

3   copying each of the plurality of packets but the last packet before forwarding each of

4   the plurality of packets; and

5   holding the last packet and repeatedly forwarding the last copied packet.

1   21.   The computer implemented method of claim 18 wherein maintaining the connection

2   comprises increasing transmission latency of each acknowledgement transmitted from the

3   protected host to the external host until the analysis is complete.

1   22.   The computer implemented method of claim 6 wherein the analyzing the file

2   comprises performing anti-virus analysis on the file.

1   23.   The computer implemented method of claim 8 wherein analyzing the header

2   comprises inspecting addresses indicated in the header against a packet filter.

1   24.   The computer implemented method of claim 10 wherein analyzing each of the copied

2   packet payloads comprises inspecting each copied packet payload against a list of disallowed

3   content and determining if each copied packet payload includes threatening script.

1   25.   An apparatus comprising:

2   a forwarding module to forward packets of a datastream along a connection between a

3   protected host and an external host; and

4   a datastream analysis module coupled with the forwarding module, the datastream

5   analysis module to analyze each of the packets to determine if each of the

6   packets are allowed or disallowed and to terminate the connection upon

7   determining one of the packets to be disallowed and to discard the disallowed

8   packet, causing the protected host to discard packets received on the

9   terminated connection prior to the disallowed packet.

1   26.   The apparatus of claim 25 further comprising a memory to store each of the packets

2   until forwarded or discarded.

1   27.   The apparatus of claim 25 further comprising a memory coupled with the datastream

2   analysis module, the memory to store copies of each of the packets' payloads.

1   28.   A machine-readable medium that provides instructions, which when executed by a set

2   of one or more processors, cause said set of processors to perform operations comprising:

3   without proxying, analyzing each of a stream of packets traversing a single

4   connection through the network access device from an external host to a

5   protected host;

6   forwarding each allowed packet of the stream of packets as long as the connection is

7   active; and

8   if one of the stream of packets is determined to be disallowed by said analyzing, then

9   discarding the disallowed packet and terminating the connection, causing the

10   protected host to discard those packets received on the terminated connection.

1   29.   The machine-readable medium of claim 28 wherein analyzing each of the stream of

2   packets comprises inspecting a header of each of the stream of packets against a packet filter.

1   30.   The machine-readable medium of claim 28 wherein analyzing each of the stream of

2   packets comprises inspecting a payload of each of the stream of packets for disallowed

3   content.

1   31.   The machine-readable medium of claim 30 wherein inspecting the payload of each of

2   the stream of packets comprises copying the payload, analyzing the payload, and discarding

3   the corresponding packet if the payload is threatening.

1   32.   The machine-readable medium of claim 28 further comprising:

2   copying a payload from each of a plurality of packets that comprise a file, the stream

3   of packets including the plurality of packets;

4   forwarding all but the last of the plurality of packets to the protected host;

5   reassembling the plurality of packets into the file;

6   analyzing the file;

7   if the file is a threatening file then discarding the last packet and terminating the

8   connection; and

9   if the file is non-threatening, then forwarding the last packet.

1   33.   A machine-readable medium that provides instructions, which when executed by a set

2   of one or more processors, cause said set of processors to perform operations comprising:

3   copying a packet payload of each of a plurality of packets received on a single

4   connection between an external host and a protected host that carries a stream

5   of packets the stream of packets including the plurality of packets;

6   forwarding all but the last of the plurality of packets to the protected host;

7   reassembling the copied packet payloads into a file;

8   analyzing the file to determine if the file is allowed or disallowed;

9   if the file is allowed, then forwarding the last packet to the protected host; and

10   if the file is determined to be disallowed, then dropping the last packet and

11   terminating the connection.

1   34.   The machine-readable medium of claim 33 wherein the analyzing the file comprises

2   performing anti-virus analysis on the file.

1   35.   The machine-readable medium of claim 33 further comprising:

2   analyzing a header of each of the stream of packets; and

3   if one of the stream of packets is determined to be disallowed, then discarding the

4   disallowed packet and terminating the connection.

1   36.   The machine-readable medium of claim 35 wherein analyzing the header comprises

2   inspecting addresses indicated in the header against a packet filter.

1   37.   The machine-readable medium of claim 33 further comprising:

2   individually analyzing each of the copied packet payloads; and

3   if one of the copied packet payloads is determined to be threatening, then discarding

4   the corresponding packet and terminating the connection.

1   38.   The machine-readable medium of claim 37 wherein analyzing each of the copied

2   packet payloads comprises inspecting each copied packet payload against a list of disallowed

3   content and determining if each copied packet payload includes threatening script.

1   39.   The machine-readable medium of claim 33 further comprising maintaining the

2   connection while analyzing the file.

1   40.   The machine-readable medium of claim 39 wherein maintaining the connection

2   comprises:

3   decapsulating the last packet's payload;

4   fragmenting the last packet's payload into subparts;

5   encapsulating each subpart; and

6   forwarding each subpart until analysis is complete.

1   41.   The machine-readable medium of claim 39 wherein maintaining the connection

2   comprises:

3   copying each of the plurality of packets but the last packet before forwarding each of

4   the plurality of packets; and

5   holding the last packet and repeatedly forwarding the last copied packet.

1   42.   The machine-readable medium of claim 39 wherein maintaining the connection

2   comprises increasing transmission latency of each acknowledgement transmitted from the

3   protected host to the external host until the analysis is complete.

1   43.   The machine-readable medium of claim 33 wherein forwarding each of the plurality

2   of packets comprises transmitting a message indicating that each of the of the plurality of

3   packets is allowed.

1   44.   A machine-readable medium that provides instructions, which when executed by a set

2   of one or more processors, cause said set of processors to perform operations comprising:

3   supporting a connection from an external host to a protected host;

4   analyzing a header of each packet received over the connection from the external

5   host;

6   terminating the connection if a first packet received over the connection is determined

7   to be disallowed and discarding the first packet;

8   if the connection is not terminated, copying the first packet's payload;

9   analyzing the first packet's payload;

10   terminating the connection if said first packet's payload is determined to be

11   disallowed and discarding the first packet;

12   if the connection has not been terminated and if said first packet's payload is not a last

13   block of a file, then forwarding said first packet to the protected host;

14   if said first packet's payload is the last block of a file, then reassembling the first

15   packet's payload with a set of one or more previously copied packet payloads

16   into the file;

17   analyzing the file to determine if the file is allowed or disallowed;

18   if the file is disallowed then dropping the first packet and terminating the connection;

19   and

20   if the file is allowed then forwarding the first packet.

1   45.   The machine-readable medium of claim 44 further comprising maintaining the

2   connection while analyzing the file.

1   46.   The machine-readable medium of claim 45 wherein maintaining the connection

2   comprises:

3   decapsulating the last packet's payload;

4   fragmenting the last packet's payload into subparts;

5   encapsulating each subpart; and

6   forwarding each subpart until analysis is complete.

1   47.   The machine-readable medium of claim 45 wherein maintaining the connection

2   comprises:

3   copying each of the plurality of packets but the last packet before forwarding each of

4   the plurality of packets; and

5   holding the last packet and repeatedly forwarding the last copied packet.

1   48.   The machine-readable medium of claim 45 wherein maintaining the connection

2   comprises increasing transmission latency of each acknowledgement transmitted from the

3   protected host to the external host until the analysis is complete.

1   49.   The machine-readable medium of claim 33 wherein the analyzing the file comprises

2   performing anti-virus analysis on the file.

1   50.   The machine-readable medium of claim 35 wherein analyzing the header comprises

2   inspecting addresses indicated in the header against a packet filter.

1   51.   The machine-readable medium of claim 37 wherein analyzing each of the copied

2   packet payloads comprises inspecting each copied packet payload against a list of disallowed

3   content and determining if each copied packet payload includes threatening script.

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